

REMARKS

Reconsideration of the application is requested in view of the amendments to the claims and the following remarks.

The claims are claims 1 to 6, the only claims presented.

With respect to the listing of references in the specification, it should be noted that Applicants submitted with the application the German and International Search reports and the cited art. The references cited in the application were cited to show the state of the art when the invention was made.

Applicants are submitting herewith amended drawings as required by the Examiner.

Claims 1 to 6 were rejected under 35 USC 112, second paragraph as being indefinite in the term “thin-walled” and term “such as”. Also objected to was the use plural “rings” and “needles” and “hardenable”.

Applicants traverse these rejections as the amended claims are believed to be definite. The singular form is now used and the claims are specifically directed to needle bearings. The “fully hardened” in line 8 conforms to the fully hardenable wall referred to in lines 5 and 6 which refers to the steel before being hardened and is believed understood by one skilled in the



In the field of needle roller bearings the name **INA** is closely linked with modern development and today's advanced technology. It stands for a comprehensive programme of needle roller and roller bearings designed for maximum space saving.

This catalogue includes extensions of existing series and some important newly developed series.

The load ratings are calculated to ISO recommendations or to DIN, having consideration for our latest experience. Load ratings calculated to other methods should not therefore be compared directly with the values given in this catalogue.

The Technical Appendix deals with the major aspects of bearing selection and application.

Due to our policy of continuous bearing development we reserve the right to introduce alterations at any time.

Qualified engineers and specialists are available to advise on your applications through the worldwide **INA** organisation.

August 1975

Industriewerk Schaeffler
INA-Nadellager

Needle roller cage assemblies also to connecting rods

Needle roller bearings with ribs unsealed a. sealed

Needle roller bearings without ribs

Needle roller bearings with adjust. clearance

Drawn cup needle roller bearings

Drawn cup roller clutches

Aligning needle roller

Combined radial-thrust

Inner rings

Thrust bearings

Needle rollers

Linear bearings

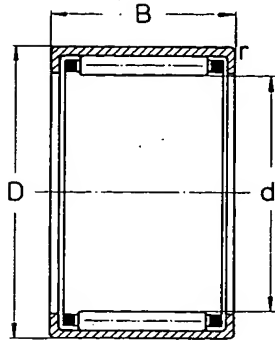
Sealing rings

Other

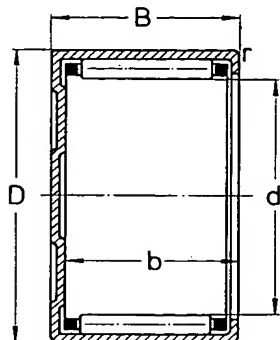
INA

Sealed drawn cup needle roller bearings: pages 62, 63.

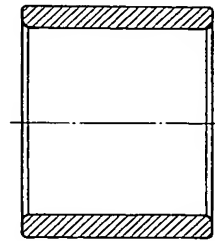
Drawn cup needle roller bearings in inch sizes: please ask for catalogue.



HK



BK



Inner rings to be ordered separately, see page 56, paragraph 2

b mm	r mm	Basic load ratings		Max. speed $n_{oil} \approx$ rev/min ¹⁾	Suitable inner rings ²⁾	
		dyn. C kp	stat. C ₀ kp		design LR ³⁾	IR ³⁾ (DIN 620)
5,2	0,8	109	61	50 000		
6,4	0,8	154	87	45 000		
7,4	1	213	129	40 000		
—	1	180	103	37 000		
7,4	1	255	162	37 000		
7,4	1	275	178	34 000		
6,4	1	244	154	30 000		
8,4	1	335	234	30 000		IR 5 x 8 x 12
8,4	1	375	275	27 000		
10,4	1	470	365	27 000		IR 6 x 9 x 12
8,4	1	390	290	24 000	LR 7 x 10 x 10,5	IR 7 x 10 x 10,5
10,4	1	490	390	24 000		IR 7 x 10 x 12
13,4	1	600	500	24 000		IR 7 x 10 x 16
8,4	1	440	350	20 000	LR 8 x 12 x 10,5	IR 8 x 12 x 10,5
9,3	1,5	580	425	20 000	LR 8 x 12 x 12,5	IR 8 x 12 x 12,5
9,3	1,5	600	455	18 000	LR 10 x 13 x 12,5	IR 10 x 13 x 12,5
9,3	1,5	630	485	17 000		IR 10 x 14 x 13
9,3	1,5	690	550	16 000	LR 12 x 15 x 12,5	IR 12 x 15 x 12,5
13,3	1,5	930	820	16 000	LR 12 x 15 x 16,5	IR 12 x 15 x 16,5
19,3	1,5	1180	1110	16 000	LR 12 x 15 x 22,5	IR 12 x 15 x 22,5
9,3	1,5	680	550	15 000		IR 12 x 16 x 13
13,3	1,5	970	860	15 000		IR 12 x 16 x 16
19,3	1,5	1160	1090	15 000		IR 12 x 16 x 22
9,3	1,5	700	580	14 000		
9,3	1,5	720	610	13 000	LR 15 x 18 x 12,5	
13,3	1,5	1030	960	13 000	LR 15 x 18 x 16,5	IR 15 x 18 x 16,5
—	1,5	570	455	12 000		
9,3	1,5	760	670	12 000		IR 15 x 20 x 13
13,3	1,5	1130	1100	12 000	LR 17 x 20 x 16,5	IR 17 x 20 x 16,5
17,3	1,5	1390	1440	12 000	LR 17 x 20 x 20,5	IR 17 x 20 x 20,5
27,3	1,5	1940	2210	12 000	LR 17 x 20 x 30,5	IR 17 x 20 x 30,5

¹⁾ With grease lubrication $\frac{2}{3}$ of the values given in the tables are permissible.

²⁾ For wider inner rings refer to page 83.

³⁾ See page 56, paragraph 2.

Drawn cup
roller
clutches

Aligning
needle roller
bearings

Combined
radial-thrust
bearings

Inner rings

Thrust bearings

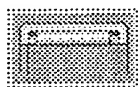
Track rollers

Linear bearings

Sealing rings
Seal rings

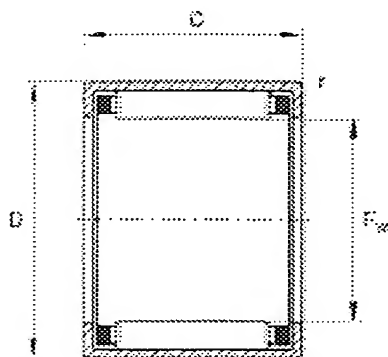
Other
INA products

Technical
drawings



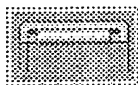
INA Drawn cup needle roller bearings with open ends HK 0912

to DIN 618-1/ISO 3245



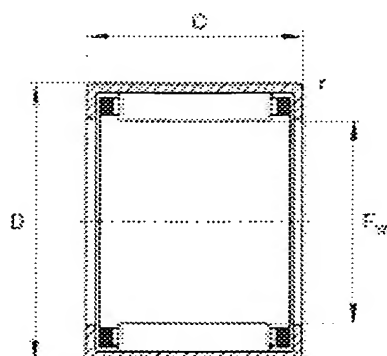
F_w	9 mm	
D	13 mm	
C	12 mm	Tolerance: -0,3
r_{min}	0,4 mm	
m	4,6 g	Mass
C_r	5300 N	Basic dynamic load rating, radial
C_{0r}	6300 N	Basic static load rating, radial
C_u	810 N	Fatigue limit load, radial
n_G	25000 1/min	Limiting speed
n_B	23000 1/min	Reference speed
	IR 6x9x12	Suitable inner ring For wider inner rings, see series IR



[Lubricant selection](#) | [Application examples](#) | [Shopping basket](#) | [Basic principles](#) | [Lexicon](#)
[Description](#) | [Data sheet](#) | [Calculation](#) | [CAD](#) | [Send to shopping basket](#) | [Tolerances to DIN 620](#)


INA Drawn cup needle roller bearings with open ends HK 1712

to DIN 618-1/ISO 3245



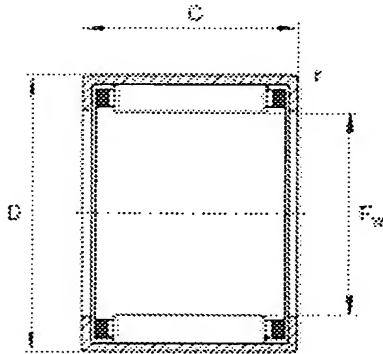
F_w	17 mm	
D	23 mm	
C	12 mm	Tolerance: -0,3
r_{min}	0,8 mm	
m	12 g	Mass
C_r	7900 N	Basic dynamic load rating, radial
C_{0r}	10300 N	Basic static load rating, radial
C_u	1200 N	Fatigue limit load, radial
n_G	14000 1/min	Limiting speed
n_B	13000 1/min	Reference speed



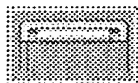


INA Drawn cup needle roller bearings with open ends HK 3020

to DIN 618-1/ISO 3245

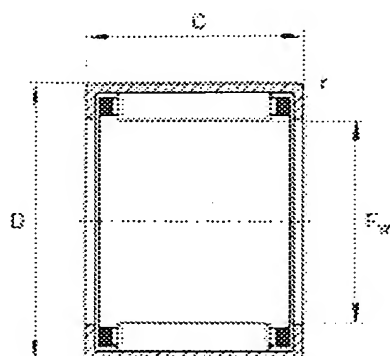


F_w	30 mm	
D	37 mm	
C	20 mm	Tolerance: -0,3
r_{min}	0,8 mm	
m	39 g	Mass
C_r	22000 N	Basic dynamic load rating, radial
C_{or}	39500 N	Basic static load rating, radial
C_u	4700 N	Fatigue limit load, radial
n_G	8500 1/min	Limiting speed
n_B	7500 1/min	Reference speed
	LR 25x30x20,5	Suitable inner ring, series LR
	IR 25x30x20,5	Suitable inner ring
		For wider inner rings, see series IR

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[Description](#) | [Data sheet](#) | [Calculation](#) | [CAD](#) | [Accessories](#) | [Send to shopping basket](#) | [Tolerances to DIN 620](#)


INA Drawn cup needle roller bearings with open ends HK 5020

to DIN 618-1/ISO 3245



F_w	50 mm	
D	58 mm	
C	20 mm	Tolerance: -0,3
r_{min}	0,8 mm	
m	70 g	Mass
C_r	31000 N	Basic dynamic load rating, radial
C_{or}	63000 N	Basic static load rating, radial
C_u	7600 N	Fatigue limit load, radial
n_G	5000 1/min	Limiting speed
n_B	4700 1/min	Reference speed
LR 45x50x20,5		Suitable inner ring, series LR



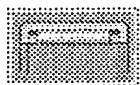


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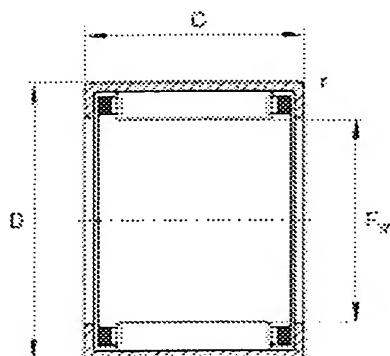
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Marie-Louise Pinset

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[Description](#) | [Data sheet](#) | [Calculation](#) | [CAD](#) | [Send to shopping basket](#) | [Tolerances to DIN 620](#)


INA Drawn cup needle roller bearings with open ends HK 0408

to DIN 618-1/ISO 3245

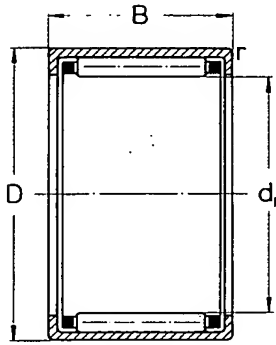


F_w	4 mm	
D	8 mm	
C	8 mm	Tolerance: -0,3
r_{min}	0,3 mm	
m	2 g	Mass
C_r	1780 N	Basic dynamic load rating, radial
C_{0r}	1310 N	Basic static load rating, radial
C_u	146 N	Fatigue limit load, radial
n_G	41000 1/min	Limiting speed
n_B	50000 1/min	Reference speed
		not available with lubrication hole.

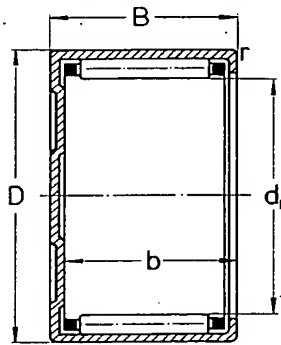


Sealed drawn cup needle roller bearings: pages 62, 63.

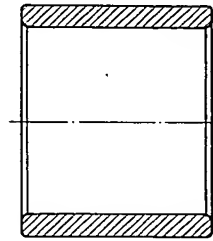
Drawn cup needle roller bearings in inch sizes: please ask for catalogue.



HK



BK



Inner rings to be ordered separately, see page 56, paragraph 2

b mm	r mm	Basic load ratings		Max. speed $n_{oil} \approx$ rev/min ¹⁾	Suitable inner rings ²⁾ design LR ³⁾	IR ³⁾ (DIN 620)
		dyn. C kp	stat. C ₀ kp			
9,3	1,5	800	730	11 000		IR 17 x 22 x 13
13,3	1,5	1 190	1 200	11 000		IR 17 x 22 x 16
17,3	1,5	1 460	1 570	11 000		IR 17 x 22 x 23
—	1,5	520	410	11 000		
—	2	1 450	1 360	11 000		
—	1,5	540	445	10 000		
9,3	1,5	970	830	9 500	LR 20 x 25 x 12,5	IR 20 x 25 x 17
13,3	1,5	1 390	1 320	9 500	LR 20 x 25 x 16,5	IR 20 x 25 x 20,5
17,3	1,5	1 770	1 800	9 500	LR 20 x 25 x 20,5	IR 20 x 25 x 26,5
23,3	1,5	2 260	2 470	9 500	LR 20 x 25 x 26,5	IR 20 x 25 x 38,5
35,3	1,5	3 050	3 600	9 500	LR 20 x 25 x 38,5	
13,3	1,5	1 450	1 440	8 500		IR 22 x 28 x 17
17,3	1,5	1 850	1 970	8 500	LR 22 x 28 x 20,5	IR 22 x 28 x 20,5
9,3	1,5	1 070	990	8 000	LR 25 x 30 x 12,5	IR 25 x 30 x 17
13,3	1,5	1 530	1 560	8 000	LR 25 x 30 x 16,5	IR 25 x 30 x 20,5
17,3	1,5	1 950	2 130	8 000	LR 25 x 30 x 20,5	IR 25 x 30 x 26,5
23,3	1,5	2 480	2 900	8 000	LR 25 x 30 x 26,5	IR 25 x 30 x 38,5
35,3	1,5	3 350	4 250	8 000	LR 25 x 30 x 38,5	
—	1,5	2 450	2 900	7 500		
9,3	1,5	1 160	1 140	7 000	LR 30 x 35 x 12,5	IR 30 x 35 x 17
13,3	1,5	1 650	1 800	7 000	LR 30 x 35 x 16,5	IR 30 x 35 x 20,5
17,3	1,5	2 110	2 460	7 000	LR 30 x 35 x 20,5	
9,3	1,5	1 240	1 290	6 000	LR 35 x 40 x 12,5	IR 35 x 40 x 20,5
13,3	1,5	1 770	2 040	6 000	LR 35 x 40 x 16,5	
17,3	1,5	2 260	2 800	6 000	LR 35 x 40 x 20,5	
13,3	1,5	1 880	2 280	5 500	LR 40 x 45 x 16,5	IR 40 x 45 x 20,5
17,3	1,5	2 400	3 100	5 500	LR 40 x 45 x 20,5	
17,3	1,5	2 750	3 350	4 800		IR 45 x 50 x 25,5
22,3	1,5	3 400	4 450	4 800	LR 45 x 50 x 25,5	
—	1,5	1 640	1 960	4 800		
17,3	1,5	2 800	3 550	4 400		IR 50 x 55 x 20
25,3	1,5	3 700	5 100	4 400		
9,3	1,5	1 540	1 690	4 000		
17,3	1,5	2 950	3 950	4 000		
29,3	1,5	4 700	7 100	4 000		

¹⁾ With grease lubrication 2/3 of the values given in the tables are permissible.²⁾ For wider inner rings refer to page 83.³⁾ See page 56, paragraph 2.Drawn cup
needle roller
clutchesAligning
needle roller
bearingsCombined
radial-thrust
bearings

Inner rings

Thrust bearings

Track rollers

Linear bearings

Sealing rings
Snap ringsOther
INA products

Technical



Drawn Cup Needle Roller Bearings with Open Ends

Series HK

Drawn Cup Needle Roller Bearings with Closed End

Series BK

$$L = \left(\frac{C}{P} \right)^{\frac{10}{3}}$$

Shaft diameter mm	Designation		Weight	Designation	Weight	Dimensions		
	HK	special sizes HK, HK...TN	g	BK	g	d _r mm	D mm	B mm
22	HK 2212	HK 22 x 28 x 7,5 TN HK 22 x 30 x 18	13,1	BK 2212	15,2	22	28	12
	HK 2216		BK 2216	24,3	22	28	16	
	HK 2220		BK 2220	29,9	22	28	20	
			—	—	22	28	7,5	
			—	—	22	30	18	
24	—	HK 24 x 30 x 7,5 TN	10,6	—	—	24	30	7,5
25	HK 2512		20,5	BK 2512	23,2	25	32	12
	HK 2516		BK 2516	31	25	32	16	
	HK 2520		BK 2520	38,7	25	32	20	
	HK 2526		BK 2526	49	25	32	26	
	°HK 2538		°BK 2538	69	25	32	38	
28	HK 2816		30,1	BK 2816	34,1	28	35	16
	HK 2820		BK 2820	43	28	35	20	
30	HK 3012		24	BK 3012	27,9	30	37	12
	HK 3016		BK 3016	37,1	30	37	16	
	HK 3020		BK 3020	46,5	30	37	20	
	HK 3026		BK 3026	59,4	30	37	26	
	°HK 3038		°BK 3038	82,5	30	37	38	
32	—	HK 32 x 39 x 24	50,7	—	—	32	39	24
35	HK 3512		27,7	BK 3512	32,9	35	42	12
	HK 3516		BK 3516	43,8	35	42	16	
	HK 3520		BK 3520	54,8	35	42	20	
40	HK 4012		31,1	BK 4012	38,2	40	47	12
	HK 4016		BK 4016	51	40	47	16	
	HK 4020		BK 4020	63,7	40	47	20	
45	HK 4516		46,2	BK 4516	57,8	45	52	16
	HK 4520		BK 4520	72,3	45	52	20	
50	HK 5020	HK 50 x 57 x 16	72	BK 5020	87,3	50	58	20
	HK 5025		BK 5025	109	50	58	25	
	—		—	—	50	57	16	
55	HK 5520		78,0	BK 5520	93,8	55	63	20
	HK 5528		BK 5528	132	55	63	28	
60	HK 6012		49,2	BK 6012	68,1	60	68	12
	HK 6020		BK 6020	105	60	68	20	
	HK 6032		BK 6032	164	60	68	32	

TN = plastic cage, operating temperatures 120°C max. Only lubricants with a mineral oil base should be used.

° double row with lubrication hole.



Drawn Cup Needle Roller Bearings with Open Ends

Series HK

Drawn Cup Needle Roller Bearings with Closed End

Series BK

$$L = \left(\frac{C}{P} \right)^{\frac{10}{3}}$$

Shaft diameter mm	Designation		Weight	Designation	Weight	Dimensions			
	HK, HK...TN	special sizes HK	g	BK	g	d _r mm	D mm	B mm	
3	+HK 0306 TN		0,6	+BK 0306 TN	0,7	3	6,5	6	
4	+HK 0408 TN		1,6	+BK 0408 TN	1,8	4	8	8	
5	+HK 0509		2	+BK 0509	2,1	5	9	9	
6	+HK 0608		2,1	—	—	6	10	8	
	+HK 0609		2,2	+BK 0609	2,4	6	10	9	
7	HK 0709		2,5	BK 0709	2,7	7	11	9	
8	HK 0808		2,7	BK 0808	3	8	12	8	
	HK 0810		3,2	BK 0810	3,4	8	12	10	
9	HK 0910		3,5	BK 0910	3,9	9	13	10	
	HK 0912		4,2	BK 0912	4,5	9	13	12	
10	HK 1010		3,8	BK 1010	4,2	10	14	10	
	HK 1012		4,5	BK 1012	5	10	14	12	
	HK 1015		5,6	BK 1015	6,2	10	14	15	
12	HK 1210		4,6	BK 1210	5,2	12	16	10	
	HK 1212		9,1	BK 1212	10,3	12	18	12	
13	HK 1312		9,9	BK 1312	11,2	13	19	12	
14	HK 1412		10,5	BK 1412	12,1	14	20	12	
15	HK 1512		11,1	BK 1512	12,7	15	21	12	
	HK 1516		15	BK 1516	16,5	15	21	16	
	°HK 1522		20,4	°BK 1522	22	15	21	22	
16	HK 1612		11,7	BK 1612	13,8	16	22	12	
	HK 1616		15,8	BK 1616	17,6	16	22	16	
	°HK 1622		21,7	°BK 1622	23,4	16	22	22	
17	HK 1712		12,2	BK 1712	14,5	17	23	12	
18	HK 1812		13,1	BK 1812	14,9	18	24	12	
	HK 1816		17,5	BK 1816	19,9	18	24	16	
20	HK 2010		11,8	—	—	20	26	10	
	HK 2012		14,1	BK 2012	16,7	20	26	12	
	HK 2016		19,3	BK 2016	22,3	20	26	16	
	HK 2020		24,1	BK 2020	27,1	20	26	20	
	°HK 2030		34,7	°BK 2030	37,4	20	26	30	

TN = plastic cage, operating temperatures 120°C max. Only lubricants with a mineral oil base should be used.

+ not available with lubrication hole.

° double row with lubrication hole.

art as would the term “thin-walled” which is equivalent to drawn cup needle bearing as can be seen from the assignee’s partial catalog filed herewith. Claim 4 now provides antecedent base and claim 3 now clarifies that it is the fully hardened steel of the outer ring. Claim 6 has been amended to recite that it is the fully hardened steel of claim 4 has the recited composition. Therefore, the amended claims comply with 35 USC 112 and withdrawal of these rejections is requested.

Claims 1 to 6 are rejected under 35 USC 103 as being obvious from the Grell et al patent which the Examiner states discloses a thin-walled needle bearing, produced without removal of material, the outer ring produced from a cold-rolled strip, wherein the outer ring is produced from a cold-formable, fully hardenable steel, and the fully hardened wall having a core hardness of ≥ 600 HV and a surface hardness of ≥ 680 HV. With respect to the limitation of a ratio of from 1:20 to 1:5 being set between their wall thickness and the diameter of the bearing needles, as this ratio is dependent on the relative size of the rolling elements, this is seen to be a matter of routine design optimization to one of ordinary skill in the art.

Applicants traverse this ground of rejection since one skilled in the art would not be led to needle bearings with the claimed ratio of wall thickness and needle bearing diameter.

Applicants agree that Grell is an example of the closest prior art but the rolling bearing of the invention differs from the state of the art shown by the assignees catalog by the claimed ratio between the wall thickness and the diameter of the needle bearing of 1:20 to 1:5 which is not taught by Grell et al. The Examiner’s attention is directed to the comparison of the prior art illustrated by Grell et al and the assignee’s catalog and the claimed bearings in the application



INA

Catalogue GB-D 303

Industriewerk Schaeffler
INA-Nadellager
D-8522 Herzogenaurach

Needle roller cages
assemblies also for
connecting rods

Needle roller
bearings with ribs
unsealed a. sealed

Needle
roller bearings
without ribs

Needle roller
bearings with
adjust clearance

Drawn cup
needle roller
bearings

Drawn cup
roller clutches

Aligning
needle roller

Combined
radial-thrust

Inner rings

Thrust bearings

Track rollers

Linear bearings

Sealing rings

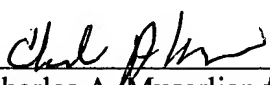
Other
INA products

Technical

as filed. This compares the prior art bearing HK 3020 (lines 23 to 25 of page 8) with the claimed bearing. Other known prior art bearings are HK 0408, HK 0912, HK 1712 and HK 5020, none of which has the claimed ratio of wall thickness to diameter of the bearing. The invention has the advantages pointed out in lines 8 to 20 of page 8 which are in no way taught by Grell et al and makes the inventive needle bearings patentable. Therefore, withdrawal of this rejection is requested.

In view of the amendments to the claims and specification and the above remarks, it is believed that the claims point out the invention. Therefore, favorable reconsideration of the application is requested.

Respectfully submitted,


Charles A. Muserlian #19,683
Attorney for Applicants
Tel. 212 302 8989

CAM:mlp
Enclosures